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GAS SAFETY VALVE

BACKGROUND OF THE INVENTION

The present invention relates to a gas safety valve and more particularly, to a gas safety valve capable of sensing a gas pressure difference in a gas pipe produced upon gas leakage from gas equipment to thereby generate a visual and audible alarm on the outside of the valve, whereby the safety checking for the gas equipment and instrument is necessarily and automatically achieved before the use of gas, thereby ensuring the use of gas in a more safe manner.

Generally, an intermediate valve, which serves to allow and stop the supply of gas to gas equipment, is legally installed at home or business places using the gas. In order to sense whether the gas leaks, conventionally proposed two methods are as follows: First, covering a soapy water on the gas equipment and instrument, for example, on the connection portion of the intermediate valve and the pipe; and Second, installation of a separate gas sensing device. In case of covering the soapy water, the following problems are arisen: First, a gas user should carefully check the whole portion of the gas equipment and instrument at any time; and Second, it is impossible to sense whether the gas leaks up to the interior of the gas instrument in an accurate manner. On the other hand, in case of installing the separate gas sensing device, the following problems are arisen: First, the price of the device is very expensive; Second, the device should operate under the condition where leaking gas concentration is over a predetermined value; and Third, its malfunction and function deterioration occur due to exhaust gas, dust, moisture and the like.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a gas safety valve capable of sensing a gas pressure difference in a gas pipe produced upon gas

leakage from a gas equipment to thereby generate a visual and audible alarm on the outside of the valve, whereby the safety checking for the gas equipment and instrument is necessarily and automatically achieved before the use of gas, thereby ensuring the fundamental prevention of gas accidents.

To attain this and other objects of the present invention, there is provided a gas safety valve which is provided with a normal pressure space into which a reference normal pressure is contained, the reference normal pressure being inputted whenever the valve is opened and closed, for comparing gas pressure varied within a pipe by an accidental cause such as for example gas leakage from gas equipment and instrument, the input of a high pressure gas and the like with the reference normal pressure and sensing whether the gas leaks, based upon the compared result, whereby it can sense gas pressure difference between the normal pressure within the normal pressure space and the gas pressure within the gas pipe, compare the normal pressure and the gas pressure newly inputted, and sense the variation of the gas pressure when the gas is cut off by a fuse coke and generate an alarming with lighting and sound.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top view illustrating a first embodiment of the present invention;

Fig. 2 is a sectional view illustrating the internal construction according to the first embodiment of the present invention;

Fig. 3 is a top view illustrating the gas safety valve according to the first embodiment of the present invention;

Fig. 4a is a top view illustrating the construction of a lever of a secondary valve and a display panel of the gas safety valve according to the first embodiment of the present invention;

Fig. 4b is a rear view of Fig. 4a;

Fig. 4c is a sectional view illustrating the installation construction of the display panel of the gas safety valve according to the first embodiment of the present invention;

Fig. 5 is a sectional view illustrating the internal construction of the gas safety valve according to the first embodiment of the present invention;

Figs. 6a to 6e are exemplary views illustrating the operation state of a secondary lever according to the first embodiment of the present invention;

Fig. 7a is an exemplary view illustrating the rotation state of a primary lever by 45° according to the first embodiment of the present invention;

Fig. 7b is a sectional view illustrating the valve at the state in Fig. 7a;

Fig. 8a is an exemplary view illustrating the rotation state of the primary lever by 90° according to the first embodiment of the present invention;

Fig. 8b is a sectional view illustrating the valve at the state in Fig. 8a;

Fig. 9 illustrates the circuit construction according to the first embodiment of the present invention;

Fig. 10 is a top view illustrating a second embodiment of the present invention;

Fig. 11a is a sectional view illustrating the internal construction according to the second embodiment of the present invention;

Fig. 11b illustrates the construction of a main gear (a primary ball) and a sub-gear (a secondary ball) according to the second embodiment of the present invention;

Fig. 11c is an exemplary view illustrating the rotation state of the main gear by 45° according to the second embodiment of the present invention;

Fig. 11d is an exemplary view illustrating the rotation state of the main gear by 90° according to the second embodiment of the present invention;

Fig. 12a is a top view illustrating the gas safety valve according to the

second embodiment of the present invention;

Fig. 12b is a perspective view illustrating a second reed switch according to the second embodiment of the present invention;

Fig. 13a is an exploded perspective view illustrating an expansion member according to the second embodiment of the present invention;

Fig. 13b is an assembled perspective view of Fig. 13a;

Fig. 14 is a sectional view illustrating the gas safety valve according to the second embodiment of the present invention;

Fig. 15 is a sectional view illustrating the rotation state of the lever by 67.5° according to the second embodiment of the present invention;

Fig. 16 is a sectional view illustrating the rotation state of the lever by 90° according to the second embodiment of the present invention;

Fig. 17 illustrates the circuit construction according to the second embodiment of the present invention;

Fig. 18 is a sectional view illustrating an internal pressure tank according to the second embodiment of the present invention;

Fig. 19 is a sectional view illustrating the valve where the internal pressure tank as shown in Fig. 18 is installed;

Figs. 20 to 23 are sectional views illustrating the gas safety valve according to a third embodiment of the present invention; and

Fig. 24 illustrates the installation of peripheral instruments relative to the gas safety valve according to the preferred embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Now, an explanation of the configuration of a gas safety valve according to a first embodiment of the present invention will be hereinafter discussed with reference to the accompanying drawings.

Figs. 1, 2 and 5 illustrate the gas safety valve according to the first embodiment of the present invention. The gas safety valve includes a primary valve 10, a secondary valve 20, a printed circuit board 30, a case 40 and a display panel 50.

The primary valve 10 is provided with a gas inlet pipe on the upper portion thereof and a connection pipe 14 for connecting with the secondary valve 20 on the lower portion thereof. And, the primary valve 10 forms a vertical passage in the interior thereof, in which a primary ball 13 for allowing/stopping the flowing of gas within the gas inlet pipe to the secondary valve 20 is assembled. The primary ball 13 is assembled by means of a bolt with a primary lever 11 disposed on the outer wall of the primary valve 10 and operates in the same direction as the primary lever 11 as the primary lever 11 works. The primary lever 11 is formed as an integral body with a primary sector gear 12 on the lower portion of the left side thereof, and a first magnet 15 is buried and assembled on the primary sector gear 12. The first magnet 15 is positioned on the horizontal center line of the primary lever 13 and at the same time, adjacent to the outer peripheral surface of the primary lever 13.

The secondary valve 20 is of a substantially cylindrical shape, where a vertical passage and an operating space 24a are arranged in parallel left and right. The vertical passage has the same center as the primary valve 10 and is coupled with an outlet 23e at the end portion thereof. Also, a secondary ball 23 having the same shape and size as the primary ball 13 is assembled on the vertical passage of the secondary valve 20, for allowing/stopping the flowing of gas through the primary valve 10 to the outlet 23e.

The secondary ball 23 is assembled by means of a bolt with a secondary lever 21 disposed on the outer wall of the secondary valve 20 and operates in the same direction as the secondary lever 21 as the secondary lever 21 works. Also, the

secondary ball 23 is disposed in the interior of the vertical passage thereof by means of a stop nut 23d which is screw-coupled to the lower portion of the vertical passage thereof. The secondary lever 21 is formed as an integral body with a secondary sector gear 22 on the left side thereof, which is gear-coupled to the primary sector gear 11, as shown in Fig. 3. The operating space 24a is disposed in the interior of a bellows housing 24, and the vertical passage and the operating space 24a communicate with each other by virtue of two horizontal passages 20a and 20b. The horizontal passage 20a is formed adjacent to the lower end of the connection pipe 14, and the horizontal passage 20b is formed adjacent to the upper end of the ~~-ilet~~ outlet 23e.

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Also, a bellows 24c and a spring 24g are disposed in the operating space 24a. The bellows 24c is formed as an integral body with a fitting cylinder 24d on the upper portion thereof. The fitting cylinder 24d is formed as an integral body with a locking protrusion 24h having the larger diameter than that of the fitting cylinder 24d on the end portion thereof. The locking protrusion 24h is adapted to be locked to a locking projection 24b formed on the bellows housing 24. The fitting cylinder 24d is assembled with a substantially cylindrical packing 24f on the inner peripheral surface thereof, with a consequence that the fitting cylinder 24d is rigidly coupled with the inner peripheral surface of the bellows housing 24. In other words, by virtue of the packing 24f, the outer peripheral surface of the fitting cylinder 24d becomes in a close contact with the inner peripheral surface of the bellows housing 24.

The bellows 24c is made of a material having a good expansion and provided with a protruded pin 24e having a predetermined length on the end portion thereof. A substantially disk type of a second magnet 25 is coupled on the end portion where the pin 24e is protruded. The second magnet 25 is provided with a hole 25a being vertically passed on the very center thereof. The pin 24e is

adapted to be protrudedly passed through the hole 25a of the second magnet 25, and the second magnet 25 is also provided with a spring 24g on the lower portion thereof.

The secondary valve 20 is bolt-coupled with two tap bolts 20d and 20e on the side wall thereof, for closing the opening for the formation of the horizontal passages 20a and 20b. Thus, the tap bolts 20d and 20e are coupled on the same positions as the horizontal passages 20a and 20b. On the top end portion of the bellows housing 24, there are provided an opening for the coupling of the bellows 24c, the second magnet 25 and the spring 24g and at the same time, a tap bolt 20c for stopping the opening in a bolt-coupling manner.

The secondary lever 21 is of a substantially cylindrical shape and as shown in Fig. 6a, formed integrally with substantially triangular interference protrusions 23b and 23c on the inner peripheral surface thereof. The secondary lever 21 is coupled to the outside of an operating shaft 23a operating the secondary ball 23. On the top portion of the secondary lever 21, as shown in Fig. 4a, there is provided a rack 50a. The rack 50a functions to operate the display panel 50 up and down, and as shown in Fig. 4b, a pinion 50b is formed integrally with the bottom surface of the display panel 50.

The printed circuit board 30 is disposed on the top portion of the bellows housing 24 of the secondary valve 20, with which a speaker 31, green and red lamps 33 and 33a and first and second reed switches 32 and 32a are assembled. The first reed switch 32 operates by means of the first magnet 15, and the second reed switch 32a operates by means of the second magnet 25. A battery 34, which supplies power to the printed circuit board 30, is disposed in a battery housing 34a on the one side of the case 40.

The case 40 is of a substantial bucket, on the center of which the primary and secondary valves 10 and 20 are passed, on the left side of which the printed

circuit board 30 is disposed and on the right side of which the battery 34 is disposed. Also, on the front surface thereof, there are provided substantially rectangular upper and lower windows 41 and 41a spaced up and down at a predetermined interval. On the upper end of the left side on the front surface thereof, there are provided a speaker grille 42 and on the lower end of the left side thereon, there are provided the lamps 33 and 33a. On the inner surfaces of the upper and lower windows 41 and 41a, there is provided a display panel guide 40a as shown in Fig. 4c.

The display panel 50 is of a substantial plate shape and has the front surface which is divided into four sections horizontally, on the upper portion of which red is displayed and on the lower portion of which green is displayed and vice versa. The display panel 50 is formed as an integral body with the pinion 50b on the rear surface thereof, coupled with the display panel guide 40a of the case 40, and operates up and down in accordance with the operation of the rack 50a of the primary lever 21.

Under the above construction, an operation of the gas safety valve according to the first embodiment of the present invention will be in detail discussed.

First, each state as shown in Figs. 1 to 3 means that as the handle grip of the primary lever 11 is in a horizontal position, the flowing of gas stops by the primary ball 13 and the secondary ball 23. At this time, the green portion on the display panel 50 is displayed on each of the upper and lower windows 41 and 41a.

Second, each state as shown in Figs. 7a and 7b means that as the primary lever 11 turns at the angle of 45 °, the primary valve 13 is partly opened, thereby allowing the flowing of gas stops to the secondary valve 20. At this time, since the flowing of gas to the secondary ball 23 is stopped, the gas flows via the horizontal passage 20a to the bellows housing 24. Firstly, if the primary lever 11 turns at the

angle of 45 °, the primary sector gear 12 moves at the angle of 45 ° in the engagement relation with the primary lever 11. Thereby, the secondary sector gear 22 of the secondary lever 21 engages with the primary sector gear 12. At this time, the interference protrusions 23b and 23c within the secondary lever 21 vary only their positions as shown in Fig. 6b, without any interference against the operating shaft 23a, thereby not operating the secondary ball 23. At this time, the first magnet 15 operates the first reed switch 12, thereby lighting the green lamp 33, which informs a user that checking commences. And, the green and red on the display panel 50 are displayed half and half on each of upper and lower windows 41 and 41a, thereby displaying that the primary valve 10 is half opened.

The gas flowing to the bellows housing 24 is used to expand the bellows 24c, in case where there is a gas pressure difference between the upper and lower portions of the closing secondary valve 20, and as the bellows 24c has been expanded, the second magnet 25 compresses the spring 24g. At this time, the second reed switch 32a operates by virtue of the second magnet 25, with a consequence that the red lamp 33a is turned on and at the same time, an alarming sound is generated through the speaker 31. The red and green on the display panel 50 are displayed in turn on each of the upper and lower windows 41 and 41a.

Third, each state as shown in Figs. 8a and 8b means that as the primary lever 11 further turns at the angle of 90 °, the primary and secondary balls 13 and 23 are completely opened, thereby normally flowing the gas. First, if the primary lever 11 further turns by the angle of 45 °, the secondary sector gear 22 is disposed on the position as shown in Fig. 6c by means of the primary sector gear 12, and at this time, the operating shaft 23a turns by the interference protrusions 23b and 23c, thereby allowing the secondary ball 23 to be opened.

If the primary sector gear 12 completely operates by the operation of the primary lever 11, the first magnet 15 is deviated from the influence of the first reed

switch 32 and thus, the green lamp 33 is turned off, thereby informing the user that the checking is completed. At this time, the red is displayed on each of the upper and lower windows 41 and 41a, which informs the user that the primary and secondary valves 10 and 20 are all opened.

Now, the operation order by steps will be explained.

In case of a normal use:

A) If the primary lever 11 of the primary valve 10 turns at the angle of 45 °, the following operations are carried out in the order of: a) the primary ball 13 is half opened; b) the first magnet 15 moves at the angle of 45 °; c) the first reed switch 32 is turned on; d) the green lamp 33 is turned on; e) the secondary lever 21 of the secondary valve 20 turns at the angle of 90 °; f) the secondary ball 23 is not changed in its position; g) the second magnet 25 is not moved; h) the second reed switch 32a is turned off; i) the red lamp 33a is turned off; j) the speaker 31 is turned off; and k) the red and green on the display window 50 are displayed in turn. The lighting of the green lamp 33 means the safety checking result for the gas equipment, and therefore, if the primary lever 11 further turns by 45 °, the gas use is possible.

B) If the primary lever 11 of the primary valve 10 turns at the angle of 90 °, the following operations are carried out in the order of: a) the primary ball 13 is completely opened; b) the first magnet 15 further rotates by the angle of 45 °; c) the first reed switch 32 is turned off; d) the green lamp 33 is turned off; e) the secondary lever 21 of the secondary valve 20 turns at the angle of 180 °; f) the secondary ball 23 is opened; g) the second magnet 25 is not moved; h) the second reed switch 32a is turned off; i) the red lamp 33a is turned off; j) the speaker 31 is turned off; and k) the red on the display window 50 is displayed. Therefore, the gas use is possible.

In case of an abnormal use:

If the primary lever 11 of the primary valve 10 turns at the angle of 45 °, the following operations are carried out in the order of: a) the primary ball 13 is half opened; b) the first magnet 15 moves by the angle of 45 °; c) the first reed switch 32 is turned on; d) the green lamp 33 is turned on; e) the secondary lever 21 of the secondary valve 20 turns at the angle of 90 °; f) the secondary ball 23 is not changed; g) the second magnet 25 moves in a direction of the spring 24g; h) the second reed switch 32a is turned on; i) the red lamp 33a is turned on; j) the speaker 31 is turned on; and k) the red and green on the display window 50 are displayed in turn. The abnormal state for the gas equipment is sensed and thus, an alarming sound is generated. In this way, the valve is closed and the cause of the abnormal state is checked.

Next, an explanation of the configuration of a gas safety valve according to a second embodiment of the present invention will be hereinafter discussed with reference to the accompanying drawings.

Figs. 10 and 11a illustrate the gas safety valve according to the second embodiment of the present invention. The gas safety valve includes a checking valve 100 installed between an inlet 200 and an outlet 300 and a case 400 on the outside thereof.

The inlet 200 into which the gas flows as shown in Fig. 14 is assembled on a joint 1020 for connecting with the checking valve 100 on the lower portion thereof. And, the inlet 200 forms a vertical passage in the interior thereof, in which a primary ball 210 for allowing/stopping the flowing of gas to a secondary ball 220 is installed. The primary ball 20 is provided with O-rings 210-1 and 210-2 installed in a horizontal state up and down.

The primary ball 210 is bolt-assembled with a lever 212 disposed on the outer wall of the inlet 200 and operates in the same direction as the lever 212 as the lever 212 turns. The lever 212 is formed as an integral body with a main gear 211

which is formed along the three quarters circumference of the lever 212 (on the left side and the lower end in the drawing) and has the surface portion divided equally into two sections, on which a red display 211a and a green display 211b are formed. On the bottom surface of the green display 211b, there is provided a substantially circular arc first magnet 105. The first magnet 105 extends partially to the bottom surface of the red display 211a and is disposed at the position slightly deviated from the influence of a first reed switch 503.

As shown in Fig. 14, the checking valve 100 is provided with a vertical passage 120, a normal pressure space 110 formed on the one side of the vertical passage 120, and first and second horizontal passages 123 and 124 between the vertical passage 120 and the normal pressure space 110. The first horizontal passage 123 is disposed on the secondary ball 220, and the second horizontal passage 124 is disposed on the lower end of the vertical passage 120.

The vertical passage 120 is formed to have the same center as the gas flowing passage 201 of the inlet 200 and coupled with the joint 1020 at the top end portion thereof and with the outlet 300 at the bottom end portion thereof. In the normal pressure space 110, there is provided an expansion member 130 as shown in Fig. 13b, and on the vertical passage 120, there is provided the secondary ball 220 which is adapted to flow the gas flowing through the primary ball 210 to a gas discharge passage 301 of the outlet 300 or the normal pressure space 110.

The expansion member 130 is positioned within the normal pressure space 110 and supported elastically by means of a spring 111a disposed on the lower portion of a tap bolt 111. In normal cases, a normal pressure is inputted on the upper portion of the expansion member 130 and a second reed switch 504 as shown in Fig. 12b is disposed on the lower portion of the expansion member 130, on the basis of the bellows 134.

Further, the expansion member 130 is assembled sequentially with a lower

cylinder 131, a spring 132, a disk 133, a bellows 134 and an upper cylinder 135, as shown in Fig. 13a. The lower cylinder 131 is provided with a plurality of holes 131c formed radically on the bottom surface thereof, a spring holder 131b on the interior thereof and an operating hole 131a formed vertically on the center thereof. The spring 132 is adapted to be fitted into the spring holder 131b of the lower cylinder 131 on the bottom end portion thereof. The disk 133 forms a hole 133a vertically passed through the center thereof. The bellows 134 forms a magnet holder 134a protruded by a predetermined length on the front end thereof, into which a substantially cylindrical second magnet 502 is inserted and assembled. The bellows 134 is preferably made of a material having an excellent expansion capability. The upper cylinder 135 is assembled integrally with a plate body having a plurality of holes 135a radically formed on the inner peripheral surface thereof.

As shown in Fig. 13c, therefore, the bellows 134 is fitted and assembled into the inner peripheral surface on the inlet side of the upper cylinder 131, the upper cylinder 35 is fitted and assembled into the inner peripheral surface of the upper portion of the bellows 134, and the spring 132 and the disk 133 are disposed between the lower cylinder 131 and the bellows 134. The magnet holder 134a of the bellows 134 holds the second magnet 502, while passing through the hole 133a of the disk 133 and at the same time being disposed up to the operating hole 131a of the lower cylinder 131.

The secondary ball 220 is disposed on the inlet of the first horizontal passage 123, while being perpendicular to the primary ball 210 and is bolt-assembled with a sub-gear 221 positioned on the outer wall of the checking valve 100. On the other hand, the secondary ball 220 operates in the same direction as the sub-gear 221 as the sub-gear 221 turns and is gear-assembled with the main gear 211. Also, the secondary ball 220 is provided with O-ring 220-1 in a vertical state left and right.

The main gear 211 and the sub-gear 221 have a gear ratio of 2:1 and are assembled each to have the rotation angles of 90 ° and 180 ° (see Figs. 11b to 11d). The sub-gear 221 is assembled with tap bolts 121 and 121a on the outer wall in the perpendicular direction thereto.

The checking valve 100 is assembled with three tap bolts 111, 121 and 121a on the side wall thereof, for stopping the openings for forming the normal pressure space 110 and the horizontal passages 123 and 124. The normal pressure space 110 is formed integrally with a switch holder 112 in which a second reed switch 504 surrounded with protecting covers 504a and 504b is assembled, on the lower end portion thereof.

On a printed circuit board 500 disposed on the one side of the checking valve 100, the first reed switch 503 is installed horizontally. On the upper portion of the first reed switch 503, there is provided a green lamp 505 and on the lower portion thereof, there are provided a red lamp 506 and a speaker 507. The first reed switch 503 operates by means of the first magnet 501 of the main gear 211, and the second reed switch 504 operates by means of the second magnet 502 of the expansion member 130. A battery 508, which supplies power to the printed circuit board 500, is disposed in a battery holder 403 on the one side of the case 400.

The case 400 is of a substantial bucket and provided with the lever 212 on the upper portion of the center thereof and a display window 401 and a speaker grille 402 sequentially on the lower portion thereof. On the one side of the display window 401, lamps 505 and 506 are disposed up and down.

Fig. 19 illustrates the gas safety valve according to the second embodiment of the present invention, where an internal pressure tank 140 is installed. The valve stops the first horizontal passage 123 provided on the side wall of the secondary ball 220 and forms the internal pressure tank 140 within in the normal pressure space 110. The internal pressure tank 140 forms an internal pressure receiving part

141 instead of the upper cylinder 135 of the expansion member 130 and is disposed elastically within the normal pressure space 110 by means of the spring 111a.

Under the above construction, an operation of the gas safety valve according to the second embodiment of the present invention will be in detail discussed.

First, the state as shown in Fig. 14 means that as the lever 212 is in a horizontal position, the flowing of gas stops by the primary ball 210, and the red display 211a on the display window 401 appears. At this time, if the lever 212 is pressed to open the primary ball 210, the first magnet 501 moves to the range of the influence of the first reed switch 503 and thereby, the first reed switch 503 is turned on. Accordingly, the power is inputted to turn the green lamp 505 on, thereby informing the user that checking commences.

If there is a gas pressure difference between the gas pressure within the normal pressure space 110 of the checking valve 100 and the gas pressure within the gas discharge passage 301, the bellows 134 of the expansion member 130 has been expanded and as a result, the second magnet 502 has turned the second reed switch 504 on. Therefore, the red lamp 506 is turned on and the speaker 507 generates an alarming sound.

Second, the state as shown in Fig. 16 means that as the lever 212 turns at the angle of 90 °, the primary and secondary balls 210 and 220 are completely opened, thereby normally flowing the gas. And, the sub-gear 221 turns at the angle of 180 ° by means of the main gear 211, thereby re-opening the secondary ball 220. At this time, the normal pressure space 110, which is in a normal pressure-contained state, is tightly closed by means of the secondary ball 220.

Now, the operation order by steps will be explained.

In case of a normal use:

A) If the lever 212 is pressed for turning in order to use gas, the following

operations are carried out in the order of: a) the first magnet 501 moves within the range of the influence of the first reed switch 503; b) the first reed switch 503 is turned on and the power is inputted; c) the green lamp 505 is turned on; and d) the fact that the checking commences is informed and the valve turns to open.

B) If the lever 212 turns at the angle of 90 ° in order to use gas, the following operations are carried out in the order of: a) the primary ball 220 is completely opened; b) the first reed switch 503 is turned on; c) the green lamp 505 is turned on; d) the sub-gear 221 of the secondary ball 220 turns at the angle of 180 °; e) the secondary ball 220 is opened; f) the second magnet 502 is not moved; g) the second reed switch 504 is turned off; h) the red lamp 506 is turned off; i) the speaker 507 is turned off; and j) the green on the display window 401 is displayed. Therefore, through the green lamp 505 and the display window 401, the fact that the gas valve is opened is recognized. As a result, the gas use is possible.

In case of an abnormal use, that is, in case where gas is used even though the defect on the gas equipment and instrument occurs:

If the lever 212 is pressed for turning, the following operations are carried out in the order of: a) the first magnet 501 moves within the range of influence of the first reed switch 503; b) the first reed switch 503 is turned on and the power is inputted; c) the green lamp 505 is turned on to thereby inform a user that checking is being carried out; d) at the same time, the red lamp 506 is turned on; e) at the same time as the order c), an alarming sound is generated from the speaker 507. In case where the gas leaks due to the defect of the gas equipment and instrument, since the gas pressure on the gas discharge passage 301 is relatively lower than that within the normal pressure space 110, the bellows 134 has been already expanded and the second reed switch 504 has been turned on by means of the second magnet 502. Therefore, with the lighting of the red lamp 506 and the generation of the alarming sound from the speaker 507, the fact that the gas is leaking due to the

defect of the gas equipment and instrument is warned, such that the valve is closed and the cause of the gas leaking is checked, for the purpose of use the gas in a safe manner.

In case where the gas equipment checking range is extended, that is, if the checking range is extended up to a desired part (see Fig. 24), the following operations are carried out in the order of: a) the lever 212 is opened in the state where a burner B is locked normally; b) a valve M up to which the checking range is extended is closed; c) in case where a problem occurs on the gas equipment up to the part where the checking range is extended, since the gas pressure on the gas discharge passage 301 is relatively lower than that within the normal pressure space 110, the bellows 134 has been already expanded; and d) the second reed switch 504 is turned on and thus, the fact that the defect exists in the corresponding gas equipment is warned with the lighting of the red lamp 506 and the generation of the alarming sound from the speaker 507.

Finally, an explanation of the configuration of a gas safety valve according to a third embodiment of the present invention will be hereinafter discussed with reference to the accompanying drawings.

Fig. 20 illustrates the gas safety valve according to the third embodiment of the present invention. The gas safety valve 100 is constructed in such a manner that a normal gas pressure is inputted to a normal pressure space 110 provided on the one side of a ball 2200 by the rotation of the ball 2200. In this way, in order to primarily induce the gas to the normal pressure space 110 when the gas flows to the opening of the inlet, it is preferred that the inner diameter of the lower O-ring 220-2 of the ball 2200 be smaller than that of the upper O-ring 220-1 thereof.

The checking valve 100 is provided with a vertical passage 120, the normal pressure space 110 on the one side of the vertical passage 120 and first and second horizontal passages 123 and 124 between the vertical passage 120 and the normal

pressure space 110. Also, the checking valve 100 is provided with an inlet having a fuse coke 201a on the upper portion thereof and an outlet 300 having a gas discharge passage 301 which is screw-coupled on the lower portion thereof.

The first horizontal passage 123 is formed on the one side of the ball 2200, and the second horizontal passage 124 is formed on the lower end portion of the vertical passage 120. The vertical passage 120 has the same center as the gas incoming passage of the inlet, and the normal pressure space 110 is provided with an expansion member 130. The vertical passage 120 is provided with the ball 2200 adapted to flow the gas flowing through the inlet to the gas discharge passage 301 of the outlet 300 or the normal pressure space 110.

The expansion member 130 is positioned within the normal pressure space 110 and supported elastically by means of a spring 111a disposed on the lower portion of a tap bolt 111. Also, in normal cases, a normal pressure is inputted on the top portion of the expansion member 130 and a second reed switch is disposed on a switch holder 112 on the bottom portion of the expansion member 130.

The ball 2200, which is positioned on the inlet of the first horizontal passage 123, is bolt-assembled to the lever disposed on the outer wall of the checking valve 100 and operates in the same direction as the lever as the lever turns. The ball 2200 is provided with the upper O-ring 220-1 having the larger inner diameter than the lower O-ring 220-1 and the lower O-ring 220-2 having the smaller inner diameter than the upper O-ring 220-1.

The checking valve 100 is assembled with three tap bolts 111, 121a and 121b on the side wall thereof, for stopping the openings for forming the normal pressure space 110 and the horizontal passages 123 and 124.

Under the above construction, the state as shown in Fig. 20 means that as the lever is in a horizontal state, the flowing of gas stops by means of the ball 2200 and the gas pressure difference between the normal gas pressure within the normal

pressure space 110 and the gas pressure flowing through the ball 2200 is always sensed.

The state as shown in Fig. 21 means that as the lever turns at the angle of 45 °, the ball 2200 turns at the angle of 45 ° and the gas flowing through the inlet is inputted to the normal pressure space 110 in the order of the upper O-ring 220-1, the ball 2200 and the first horizontal passage 123.

The state as shown in Fig. 22 means that as the lever turns at the angle of 90 °, the ball 2200 is completely opened and the gas flows normally. In this way, the normal pressure space 110 contains a normal gas pressure therein and is tightly closed by means of the ball 2200.

The state as shown in Fig. 23 means that if an amount of gas exceeding an allowable gas amount flows due to a gas leaking accident during the use of gas, the fuse coke 201a operates to close the ball 2200, such that the gas supply stops and at the same time, the gas pressure difference between the gas pressure within the normal pressure space 110 and the gas pressure flowing from the ball 2200 is sensed. Thereby, the expansion member 130 is expanded to turn the second reed switch on, thereby informing the user of the fact that the gas leaks with the lighting of lamp and the alarming sound.

In more detail, in normal cases the gas pressure difference between the gas pressure within the normal pressure space 110 and the gas pressure flowing from the ball 2200 is always sensed, and in case of flowing a high pressure gas caused to an accident to the gas equipment, in the process of opening the lever the gas pressure difference between the high pressure gas flowing to the normal pressure space 110 and the gas pressure flowing from the ball 2200 is sensed. So, the expansion member 130 is expanded, thereby alarming the gas leaking accident. And, if an amount of gas exceeding an allowable gas amount flows due to a gas leaking accident during the use of gas, the fuse coke 201a operates to close the ball

2200, such that the gas supply stops and at the same time, the gas pressure difference between the gas pressure within the normal pressure space 110 and the gas pressure flowing from the ball 2200 is sensed, thereby informing the user of the fact of the gas leaking accident.

In case where the gas equipment checking range is extended (see Fig. 24), if necessary, the valve M corresponding to the checking range is closed in the state where the ball 2200 has been opened and therefore, the gas safety checking range is extended up to the closed valve M.

While well recognizing the danger of gas accidents, an incomplete safety checking for the gas equipment is caused due to some problems that existing gas equipment checking methods are inconvenient to use, the reliability thereof is relatively lowered and the functions are exerted in a limited range, depending upon installation environments (underground piping, wall body installation, or the interior of gas instrument). However, as discussed in the foregoing, a gas safety valve according to the present invention is capable of automatically carrying out a perfect safety checking for the whole gas equipment, previously alarming the accident caused by the input of a high pressure of gas, cutting off the flowing of gas by means of a fuse coke if an amount of gas exceeding the allowable amount thereof flows and at the same time informing a user of the fact with an alarming sound and lamp, thereby preventing the gas leaking accident which may be generated during use of gas. In addition, the checking range for the gas equipment and instrument may be extended to a desired part.